

Task Title: Microfabricated Thin Film Sensors for NDE applications

I. Objectives: Develop microfabricated thin film sensors for use as NDE tools for thermal barrier coatings on metal and ceramic matrix composite substrates in harsh environment applications. These sensors could be used for a variety of applications that use thermal barrier coatings.

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Technical Methodology/Approach: Microfabricated thin film sensor technologies will be advanced to provide tools for advanced materials/components characterization. Areas that will be addressed are measurement of temperature and strain profiles across thermal barrier coatings (TBC) on metal and ceramic matrix composites (CMC) during high temperature operation. Sensors will be applied on the TBC surface and at the interface between the TBC and the substrate to evaluate the cooling and stress effect of the TBC. This information can be used to significantly improve the life and effectiveness of these coatings.

III. Customers: The customers include UEET, HOTPC, Information Rich Test Instrumentation, Shuttle Upgrade, Second Gen. and X-33/RLV. The technologies are applicable to all hot propulsion applications. The use of TBCs is becoming increasingly widespread for both NASA and industrial applications as materials are being pushed for use to higher temperatures.

IV. Metrics: A project schedule with milestones will be developed and reviewed with the customer(s) on a regular basis. Evaluation of material compatibility and sensor durability will be addressed. The instrumented components will be evaluated in the laboratory as well as in a burner rig test facility.

V. Products: The task will result in high temperature minimally intrusive physical sensors that can be operated up to 1200°C (2200°F) on TBC coated metals and CMCs. Emphasis will be given to sensor performance evaluation.

VI. Schedules/Milestones:

- Determine material compatibilities (6/02)
- Sensor microfabrication on metal substrates with TBC (12/02)
- Demonstrate sensors on TBC coated metal substrates in burner rig test (6/03)
- Sensor microfabrication on CMC substrates with TBC (12/03)
- Demonstrate sensors on TBC coated CMC substrates in burner rig test (6/04)
- Final report, technology transfer activities (9/04)